

NSTEPS in Oregon- Stressor-Response Relationships in OR Ecoregions

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Tetra Tech
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Why Algae?

- Excess aquatic plant growth is costly to human health & the environment
- Can cause water quality impairments (e.g., DO & pH violations)



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Blue-green algae in Willamette River found to be a toxic species; warning area of river expanded



Most Read

Preparing for Ebola

Legacy Health currently has six Ebola preparedness kits, and they're using a set of guidelines for treating Ebola patients that exceed those of the CDC. ... [Story](#) + [photos](#)

Health & Fitness Resources

[Dr. Oz & Dr. Roizen health tips](#)

[Health & Fitness resources \(links\)](#)

A green algae bloom is clearly visible along the shores of the Willamette River under the Marquam Bridge, Sep 17, 2014. Oregon Health Authority are still awaiting the results of a test that will show if the blue-green

Oregon Examples

- Deschutes River:
 - Public complaints of excessive algal growth and changes in macroinvertebrate assemblage following installation of a variable-depth flow control structure below Lake Billy Chinook
 - Nuisance aquatic weeds & excess algal growth above Bend




Oregon Examples

- Rogue River: public complaint of excess algal growth below a sewage treatment plant outfall



Photo by Shannon Hubler, ODEQ

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Medford sewage plant hurts the Rogue River, study finds

AP By The Associated Press
Follow on Twitter
on February 13, 2013 at 11:03 AM Print

MEDFORD — A study commissioned by fly-fishing groups contends the effluent released from Medford's wastewater treatment plant illegally harms insect life and promotes unwanted algae growth in the **Rogue River**.

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Sponsored Link

The study says the pollution could harm chinook salmon eggs laid in gravel downstream of the treatment plant near **TouVelle State Park**.

One of the study's sponsors says the city and the state Department of Environmental Quality should set a schedule for investigating and fixing the problem, the **Medford Mail Tribune reported Wednesday**.

"Most of us would say, 'It's a sewer plant and we need to accept it,'" said John MacDiarmid of the Medford-based **Rogue Flyfishers Association**. "But you can't impact the beneficial uses of the river. ... They need to clean it up."


Medford Public Works Manager Cory Crebbin said the plant is operated so the released effluent is "always well within the parameters" of water-quality standards set by the DEQ permit.

[Read more](#) the wastewater treatment plant for changes in

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Identifying causes for excessive plant growth

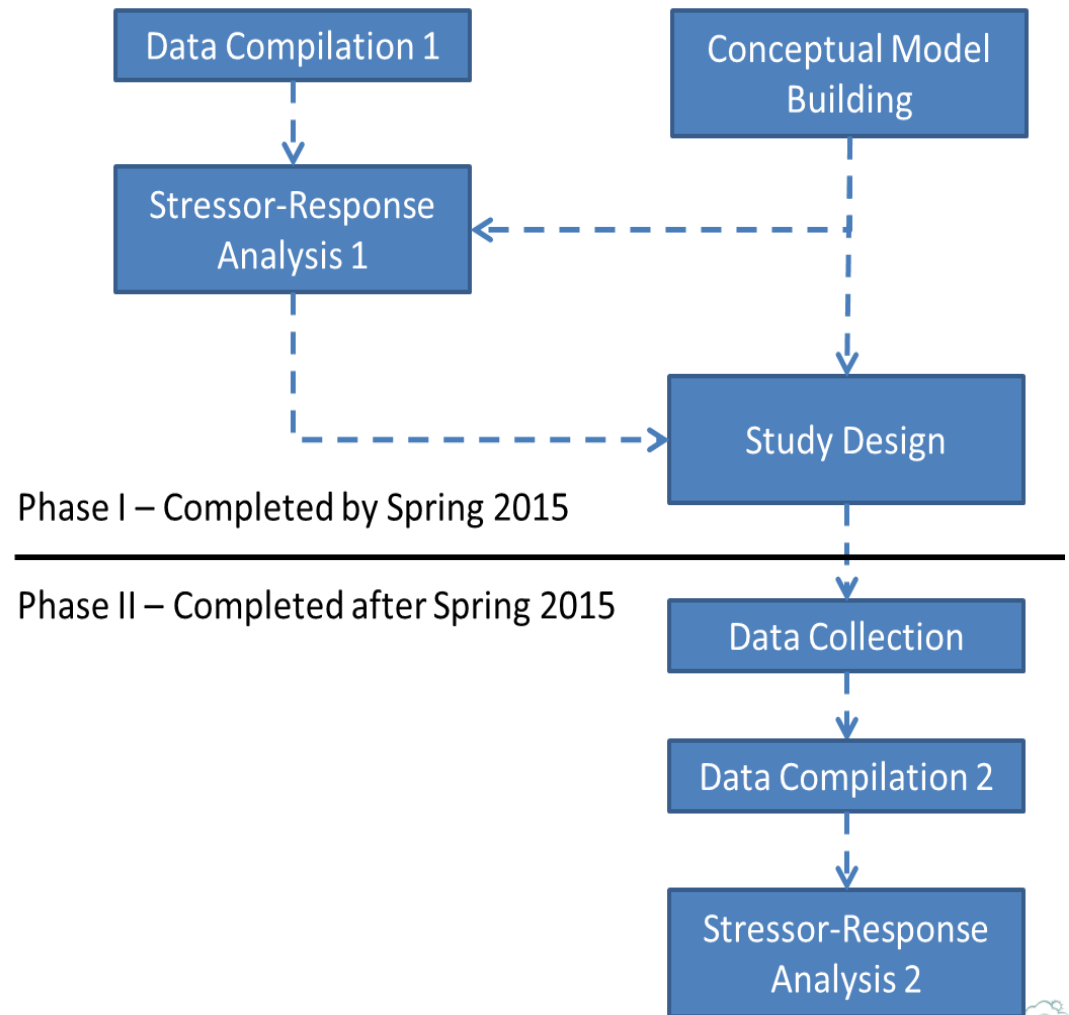
- Limited tools available to easily identify causes
- Nutrient enrichment often is a cause, but identifying types and forms responsible can be intensive and expensive
- Complicated by effects of temperature, light, invasive/introduced species, and flow
 - need to be taken into account for nutrient assessments

Objectives

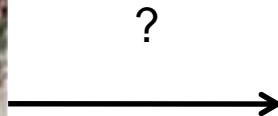
- Develop stressor-biological response models to screen streams and rivers statewide for effects of nutrient enrichment on algal species and growth
 - Response variables: metrics of periphyton communities and productivity
- Use tool to help identify and prioritize statewide monitoring efforts for water quality impairments

Project Plan and Timeline

- Data compilation: Jon Harcum, Tetra Tech
- Conceptual Model: Dan Sobota & Shannon Hubler, ODEQ
- Stressor-Response: Mike Paul, Tetra Tech
- Study Design: N-STEPS OR Team
 - ODEQ
 - EPA
 - Tetra Tech
 - USGS
- Phase II: dependent upon ODEQ monitoring priorities
 - Final statewide screening tool could be years in the making



Conceptual Model



"State" Factors

Time/ hydrology

Position on
hydrograph

Habitat

Substrates
Gradient
GW – SW Exchange
Chemical conditions

Resources

Light
Nutrients

Climate

Temperature
patterns

Biology

Species pool

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Aquatic plant community

Macrophytes

bryophytes

Periphyton

Phytoplankton

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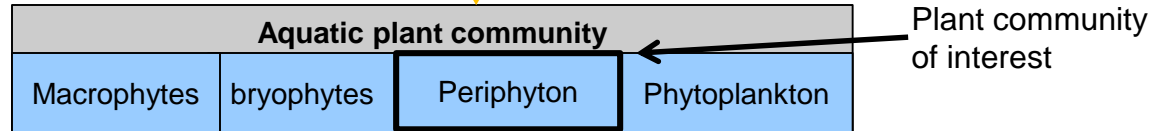
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Phytoplankton

Plant community
of interest

Δ
metabolism

Respiration \uparrow

Daily pH
peaks \uparrow

Photosynthesis \uparrow

More extreme DO
peaks & troughs

Δ abundances /
biomass / density

\uparrow chlorophyll

\uparrow biomass

Δ community
characteristics

\downarrow sensitive taxa: e.g., high
DO, halophobic, oligotrophic

\uparrow tolerant taxa: e.g., low DO,
halophilic, N-heterotrophic

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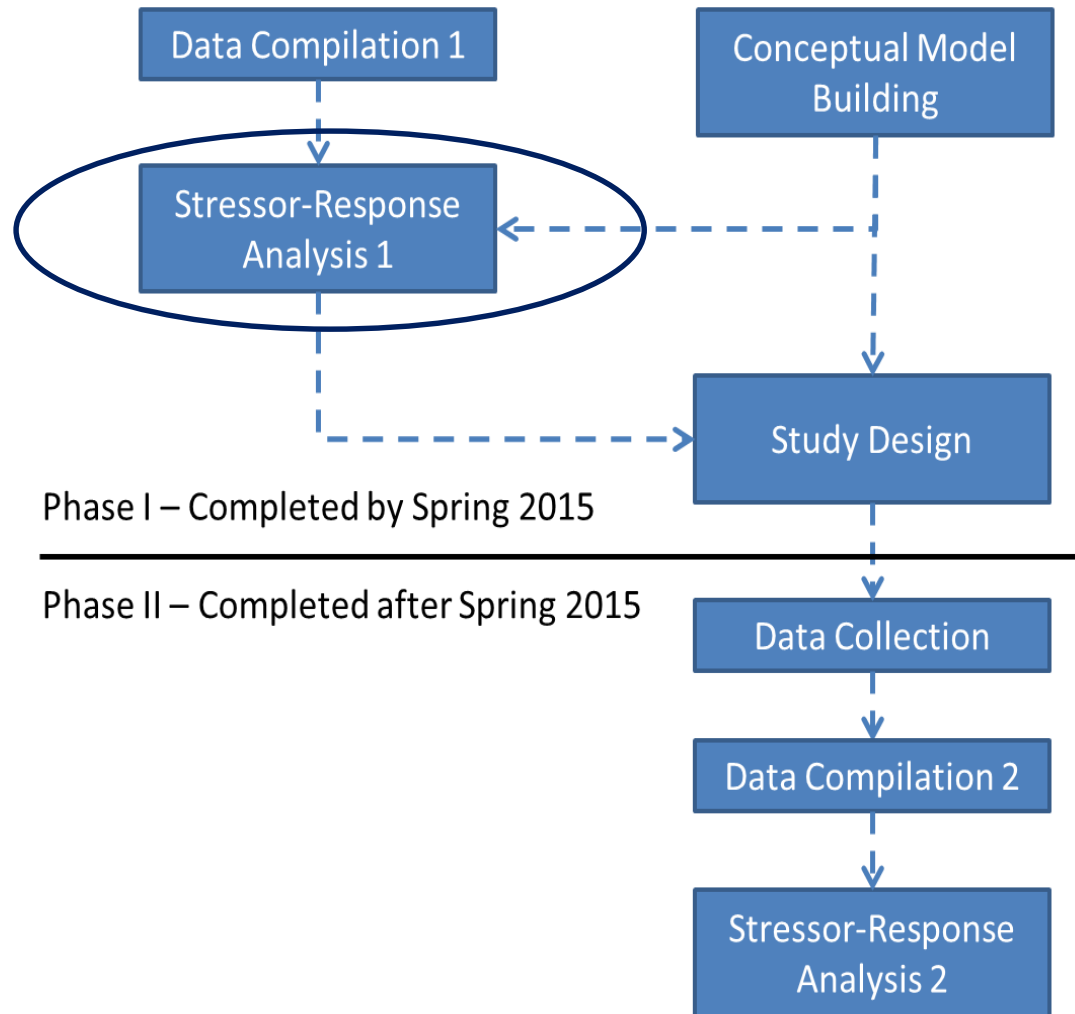
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Data compilation

- MS Access database delivered by Tetra Tech
- Unique sites: 4,331
- Chemistry + periphyton assemblage

Agency	Project	n	Scale
EPA/ODEQ	EMAP-West	1,915	Nation
	NRSA	1,924	Nation
USGS	NAWQA-NWIS	225	ID – 70 WA – 106 OR - 49
	Clackamas	24	OR basin
	Molalla	5	OR basin
	N. Umpqua	28	OR basin
IDEQ		210	ID

Next Steps



Stressor Response Analysis I

- Exploratory summaries
- Classification analyses
- Linear and nonlinear stressor-response models
- Conditional probability estimates for response thresholds
- Nonlinear and/or nonparametric models

Stressor Response Analysis I (cont'd)

- Highlight data gaps for stressor, responses, confounding variables, and co-occurring stressors
- Facilitate conceptual model evaluation and refinement
- Serve as the focus of additional data collection

Considerations for Phase II

- Collect new data (Deschutes – 2016, other rivers as funding becomes available)
- Make use of data collected by Portland State, consulting firms, and USGS for model validation/modifications
- Explore use of Structural Equation Modeling for confirming conceptual model structure and examining indirect effects

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Toxicity of
other
pollutants \uparrow

Hypoxia \uparrow

Trophic
interactions

Macroinvertebrates
&
Fish

Larger
Picture

Acknowledgements

- Rochelle Labiosa, US EPA Region 10
- Jacques Oliver, US EPA HQ
- Chauncey Anderson & Kurt Carpenter, USGS
- Bonnie Lamb, Deb Sturdevant, Gene Foster, & Aaron Borisenko, ODEQ

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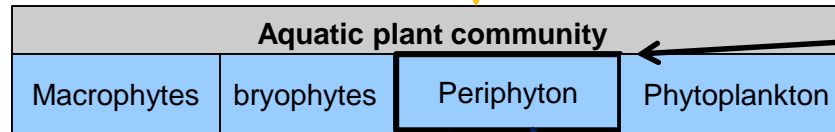
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Questions?